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Assessing the utilization of Green Biorefinery by-products

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The current trend on biomass conversion points towards a more efficient utilization of the feedstock in multi-output biorefineries, and the identification of the best biomass resources, since the feedstock cultivation itself plays an important role in the overall sustainability and cost of the process [1].

Grassy biomass in this context provides an interesting choice. This feedstock can be grown with high yields and low inputs of fertilizer and pesticides, can be cultivated on marginal land and could have intriguing side effect like conservation and improvement of cultural landscape and of the so called “stay option” for the farmers [2]. Thus exploiting this feedstock in a sustainable way not only offers high economic potential, but support sustainable development in rural region [3].

In this study, the initial results of a life-cycle assessment (LCA) of an integrated green-biorefinery utilizing grassy biomass are presented. The biorefinery has three output streams (protein, solid residue, liquid residue) and is compared to the existing conventional single-output process, namely green-crop drying process. The green-biorefinery can be easily implemented in the existing infrastructure of the green-crop drying plant.

The assessment combines LCA and material flow analysis and is done using EASETECH [4], a specific LCA software developed for waste and biorefinery analysis. Specific attention is given to the utilization of the output streams for different purposes, especially the solid stream.

Results show the integrated biorefinery solution provides large environmental burden reduction compared to the conventional plant. The best utilization of the solid stream is for feed purposes, mainly due to lower Indirect land use changes (iLUC) induced by this solution [5]. Utilization of the solid residue for energy production could lead to higher savings but those are counterbalanced by inducing higher iLUC.

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